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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/879,875	06/11/2001	Abu K. Eghan	X-901 US	4969

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EXAMINER

PERT, EVAN T

ART UNIT	PAPER NUMBER
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2829

DATE MAILED: 07/26/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/879,875

Applicant(s)

EGHAN ET AL.

Examiner

Evan T. Pert

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 April 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-12 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-12 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 11 June 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Specification

1. The disclosure is objected to because of the informality at line 3 of page 7 consisting of "dielectric constant (5 to 9 ppm/°C)" which should read --dielectric constant (and CTE of 5 to 9 ppm/°C)--, or the equivalent.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-12 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

"Formed Together"

In claim 1, line 5, the limitation "being formed together from the same material" is not clear. While the plain meaning of "formed together" might be interpreted as "formed integrally", the examiner interprets "multiple layers adhered together as a laminate structure all at once or layer-by-layer" as being included in the meaning of "*formed together* from the same material", for purposes of examination. As an example of the examiner's interpretation, referring to U.S. Patent 6,020,221, an exemplary Al₂O₃ stiffener 20 and Al₂O₃ lower portion 14 actually do form a substrate with "a recessed central region" and "a raised perimeter" wherein the "central region" and "perimeter" meet the claim limitation of "being formed together from the same material."

"Recessed Region"

In claim 1, lines 6-7 and claim 10, lines 5-6, the limitation "the recessed central region having a plurality of contacts" is not clear. By the plain meaning of the language, a "region having...contacts" could mean that contacts are formed in the "recessed *region*", looking from above, but not actually *inside* the recess itself.

For purposes of examination, however, the examiner interprets "having contacts *in the recessed region*" to mean that the contacts are actually "inside the recess". For example, referring to U.S. Patent 5,739,585, the examiner does not interpret the inherent "contacts" of wires 32 to wires 14 to be "in" the recessed region where chip 18 sits, even though the contacts are "in" the *region* when looking from above.

"Incorporates a capacitor"

In claim 9, line 2, the meaning of "incorporates a capacitor" is vague in view of the written description of applicant's disclosure where the raised perimeter of the substrate "forms" the capacitor, rather than merely "includes" one. In claim 10, line 5-6, "incorporating at least one capacitor" is also vague. For purposes of examination, the limitation "incorporates a capacitor" is interpreted as meaning "*forms a capacitor*" since applicant's written description discloses that the raised perimeter does not merely include some kind of capacitor connection, but actually forms the working parts of an intentionally arranged capacitor [as exemplified by applicant's Fig. 7].

Furthermore, it is unclear what value of capacitance or what specific structure constitutes applicant's claimed "capacitor" in view of the notoriously well-known law of electro-physics that: *all conductive parts insulated from each other form a "capacitance"*

that can be considered to be a "capacitor". For purposes of examination, a "capacitor" is considered as a structure that provides a significant value of capacitance on the order required for supply by-pass purposes, rather than on the order of inherent capacitance that exists between all signal lines of a semiconductor device.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-3 and 5-7 rejected under 35 U.S.C. 102(b) as being anticipated by Lim et al. (U.S. Patent 6,020,221).

Claim 1

Regarding claim 1, Lim et al. teach a packaged integrated circuit device

[abstract] comprising :

a substrate having a recessed central region surrounded by a raised perimeter, the recessed central region and the perimeter being formed together from the same material [Stiffener 20 forms the "raised perimeter" and package substrate 14 forms the "central region", and both collectively "form together" a single "substrate that is made of the same material" such as ceramic Al_2O_3 as taught at col. 5, lines 20-24 and lines 56-60], wherein the "central region has a plurality of contacts" to balls 30 which make external electrical connection to balls 64 [col. 1, lines 39-48]; and

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an integrated circuit device 12 formed with contacts on a top surface 16b, flipped, and placed against the recessed central region of the substrate such that the contacts of the integrated circuit device meet the contacts inside the recess at the central region of the substrate [Fig. 8 balls 30 contact *inherent* contacts in the central region where device 12 sits, per col. 1, lines 46-48, for example].

Claim 2

Regarding claim 2, device balls 30 electrically contact external balls 64 [col. 1].

Claim 3

Regarding claim 3, Lim et al. anticipate that the collective “substrate” of a stiffener and a package substrate are formed from “ceramic” Al_2O_3 . [col. 5, line 18-25 and lines 56-60].

Claim 5

Regarding claim 5, electrical contacts under chip 12 inside the recess “comprise solder bumps.” [col. 5, lines 31-37]

Claim 6

Regarding claim 6, Lim et al. anticipate that protective layer 44 can *inherently* serve as a “heat spreader” as they anticipate connecting surface 16a of chip 12 to copper or aluminum layer 14 using “thermal grease” [col. 5, lines 50-55].

Claim 7

Regarding claim 7, the protective layer 14 serving as a “heat spreader” is arranged such that it “further contacts the raised perimeter.” [Fig. 8]

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4. Claim 10 is rejected under 35 U.S.C. 102(b) as being anticipated by Bhattacharyya et al. (U.S. Patent 5,608,261).

Claim 10

Bhattacharyya et al. teach an integrated circuit package substrate 10 comprising:
a recess(ed central region) having a plurality of contacts inside the recess(ed central region *on* bonding shelves 13 and 15 inside the recess in a “central region”) for (electrical) connection to integrated circuit device 20; and
a raised *peripheral area* “incorporating” capacitors 22 and 23 (electrically) connected to contacts in the “central region” [cover figure].

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lim et al. as applied to claim 3 above, and further in view of Hoang (U.S. Patent 6,201,301).

Claim 4

Lim et al. do not teach “including glass” in the ceramic substrate material, to thereby comprise “a glass ceramic material”, but Hoang teaches that “glass-ceramic silicon *has been used*” [col. 1, lines 64-67].

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At Hoang's suggestion, it would have been obvious to one of ordinary skill in the art at the time of applicant's claimed invention to utilize "glass ceramic" as the material forming a stiffener and package substrate to collectively form the "substrate having a raised perimeter and central recessed region." One of ordinary skill in the art would have been motivated by design choice for the particular material properties of glass ceramic in view of the teaching of Hoang that glass ceramic silicon "has been used" as substrate materials in the past.

Allowable Subject Matter

6. Claims 8-9 and 11-12 would be allowable if rewritten to overcome the rejections under 35 U.S.C. 112, second paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

7. The following is a statement of reasons for the indication of allowable subject matter:

Regarding claim 8, while packages exist with drop-in heat spreaders that are flush with a package surface, the prior art does not fairly teach or suggest applicant's collectively claimed invention wherein the substrate of a common material is formed to have a raised perimeter surrounding a central recess having contacts in the recess receiving a flipped chip wherein a heat sink is connected with thermal grease to the back of the flipped chip in the central recess and the heat sink is recessed into the raised perimeter such that an upper surface of the heat spreader is planar with an upper surface of the raised perimeter. The claimed package arrangement, exemplified by Fig.

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6, provides "for attachment of an external heat sink" [0026] in the claimed package having improved resistance to thermal expansion and contraction [0013].

Regarding claim 9, the prior art does not fairly teach or suggest applicant's collectively claimed invention wherein the substrate of a common material is formed to have a raised perimeter surrounding a central recess having contacts in the recess receiving a flipped chip and wherein the raised perimeter of the package forms a capacitor, as an integral part of the raised perimeter of the package, allowing close placement "adjacent to the chip" [page 7].

Regarding claims 11-12, the prior art does not teach or fairly suggest an integrated circuit package substrate of common material having a recess surrounded by a raised peripheral area, the raised peripheral area *forming* a capacitor with sandwich construction comprising a plurality of plates that are integral to the raised peripheral area.

Response to Arguments

8. Applicant's arguments with respect to claim 1-12 have been considered but are moot in view of the new grounds of rejection.

Conclusion

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Evan T. Pert whose telephone number is 703-306-5689. The examiner can normally be reached on M-F (7:00-3:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Sherry can be reached on 703-308-1680. The fax phone numbers

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for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

ETP
July 24, 2002


EVAN PERT
PATENT EXAMINER